Questions (Mechanisms part)

IMPORTANT OBSERVATIONS:

1) **For each scheme of mechanisms** solve consequently the following steps (for minimum points !):

- **Identify the elements** (by using numbers), write it's order (rank) and write the type of motion which is making each of mobile elements during the functioning of mechanism;

- **Identify the pairs** between elements (example A={1,2} pair between element 1 and element 2) and describe them according to the *four criteria of classification of pairs*;

- **Compute the mobility** of mechanism and make some comments with respect to this result.

2) For the main part of questions **explain, demonstrate, give examples, make comments**. (for full allocated points)

Questions

1. Which are the differences between a machine and a mechanism ? Explain and give examples.

2. Which are the main topics in the theoretic study of mechanisms ? Explain and give examples.

3. Which is the difference between a kinematic chain and a mechanism ? Give example on slider-crank linkage.

4. Which is the difference between a truss and a mechanism ?

5. Which are the general hypotheses of the theory of mechanisms? Explain and give examples.

6. Define a link as accepted in theory of mechanisms ? Give example.

7. What is the order (or rank) of a link ? Give examples.

8. What is a joint (or pair) ? Give at least 7 different examples.

9. What is the class of a joint ? Give at least 7 different examples.

10. Make a classification of joints from geometrical point of view. Give examples.

11. Make a classification of joints from constructional point of view. Give examples.

12. Make a classification of joints from functional point of view. Give examples.

13. Demonstrate that a body free in plane has 3 degrees of freedom.

14. Demonstrate that a body free in space has 6 degrees of freedom.

15. What represents the degrees of mobility (or simple Mobility – referred sometime as DOF) ? How it is computed for planar mechanisms ? Give examples.

16. What represents the degrees of mobility (or simple Mobility – referred sometime as DOF) ? How it is computed for spatial mechanisms ? Give examples.

17. Enumerate the main categories of mechanisms from structural point of view. Give examples.

18. Enumerate the main categories of mechanisms from application point of view.

19. Which are the problems of kinematics ? Exemplify in the study of four-bar mechanism.

20. Explain the problem of kinematics analysis. Use as example the four-bar mechanism.

21. Explain the problem of kinematics synthesis. Use as example the four-bar mechanism.

22. Explain the problem of kinetostatics analysis. Use as example the four-bar mechanism.

23. Which is the difference between kinematics and kinetostatics, from analysis point of view ? Exemplify in the study of four-bar mechanism.

24. Which is the difference between synthesis and analysis, from kinematics point of view ? Exemplify in the study of four-bar mechanism.

25. Draw the extreme positions of the four-bar mechanism on same drawing. Explain how they are obtained.

26. Draw on same drawing the extreme positions of all elements of the off-set slider-crank mechanism. Explain how they are obtained. Show the positions of crank and connecting rod.

27. Explain the difference between slider-crank and crank-slider mechanisms, from structural analysis point of view.

28. Draw the crank-slider-rocker mechanism (quick return mechanism) and make the structural analysis of it.

29. Draw on same drawing all extreme positions of quick-return mechanism (from slider point of view and from rocker point of view). Explain how they are obtained.

30. When a kinematic chain consist of 4 elements with 2 sliders (which are sliding along 2 perpendicular directions) is transformed in a Scotch-Yoke mechanism ? Explain by identifying the elements in kinematic chain and in mechanism.

31. When a kinematic chain consist of 4 elements with 2 sliders (which are sliding along 2 perpendicular directions) is transformed in a Oldham mechanism ? Explain by identifying the elements in kinematic chain and in mechanism.

32. When a kinematic chain consist of 4 elements with 2 sliders (which are sliding along 2 perpendicular directions) is transformed in a mechanism which is drawing Ellipses ? Explain by identifying the elements in kinematic chain and in mechanism.

33. Draw the rotary Geneva mechanism. With which mechanism is equivalent ? Explain and comments.

34. Draw the ratchet mechanism actuated by four-bar linkage. Identify elements and joints between them. Explain the functioning of it.

35. Draw the graphical solution of function generation four-bar mechanism in order to actuate a ratchet mechanism with functioning coefficient $k_t = 1$. Explain each step and motivate the solution.

36. With what is equivalent a higher pair ? Give examples.

37. Give at least 2 examples of higher order pairs. When the Chebishev-Kuzbach-Greubler's formula of computing mobility could not be applied ?

38. Which are passive elements and why they are used in mechanisms ? Explain and give examples.

39. When parasitic (uncontrolled) motion appears in mechanisms ? Give some examples. Explain the results in term of degrees of mobility.

40. Draw a planar rotating cam mechanism with roller follower and linear motion of the follower. Identify elements and joints. Make comments.

41. Draw a planar rotating cam mechanism with roller follower and rocking motion of the follower. Identify elements and joints. Make comments.

42. Draw a planar rotating cam mechanism with flat follower and linear motion of the follower. Identify elements and joints. Make comments.

43. Draw a planar rotating cam mechanism with flat follower and rocking motion of the follower. Identify elements and joints. Make comments.

44. Draw a planar rotating cam mechanism with pin follower and linear motion of the follower. Identify elements and joints. Make comments.

45. Draw a planar rotating cam mechanism with pin follower and rocking motion of the follower. Identify elements and joints. Make comments.

46. Draw a planar rotating cam mechanism with roller follower on track and rocking motion of the follower. Identify elements and joints. Make comments.

47. Draw a planar rotating cam mechanism with roller follower on track and linear motion of the follower. Identify elements and joints. Make comments.

48. Draw a planar translating cam mechanism with roller follower and linear motion of the follower. Identify elements and joints. Make comments.

49. Draw a planar translating cam mechanism with roller follower and rocking motion of the follower. Identify elements and joints. Make comments.

50. Draw a spatial rotating cam mechanism with roller follower and linear motion of the follower. Identify elements and joints. Make comments.

51. Draw a spatial rotating cam mechanism with roller follower and rocking motion of the follower. Identify elements and joints. Make comments.